THE ARIZONA PROFESSIONAL LAND SURVEYORS ASSOCIATION
GEOSPATIAL ORGANIZATION COMMITTEE

The Geospatial Debate

Responsibility for the Development, Management and Use of Geospatial Data in Arizona

APLS Geospatial Organization Committee

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The Geospatial Debate

Introduction

Purpose

This document has been compiled to provide insight into some of the events, activities, and history of the Arizona Professional Land Surveyors (APLS) Geospatial Organization (GO) Committee, particularly as it applies to the question of geospatial data and the safety, health and welfare of the public. A recent impetus for developing this document is a letter of inquiry from Mr. Larry Dresden, RLS, to the Arizona State Board of Technical Registration (SBTR). Mr. Dresden has requested that the SBTR clarify its interpretation of Land Surveying practice as defined in Arizona Revised Statutes (ARS 32-101.22(d)) regarding development of mapping data by individuals who are not registered as Land Surveyors or Engineers and who are not working under the supervision of such registrants.

The SBTR has given APLS permission to review and comment on this issue. To accomplish this, the GO Committee has been tasked by the APLS Board of Directors to review and respond to the Dresden letter, and ultimately to make recommendations that will be taken before the SBTR.

The purpose of this document is to give an overview of the history, issues, and key concepts in order to provide an organized understanding relating to the development, management and use of geospatial data in Arizona. As such, this is an educational document, and the educational aspects will be continued in a series of forums to geospatial professionals. The GO Committee will then combine the educational information with input from the forums to develop recommendations that will be presented to the APLS Board of Directors. Subject to approval by the APLS Board of Directors, these recommendations (and possible solutions) will be presented to the SBTR Rules and Legislative Committee.

Background

Historical Background

Geographic Information Systems (GIS) have been on an evolutionary climb for nearly 30 years. Although the concept of GIS has existed for thousands of years, technology has pushed developmental limits. Originally GIS could have been considered as simple as the overlay process using parched paper. Once Mylar was invented the overlay process became easier. Although the rich database complexities of GIS were not present, the simple process of overlaying one map upon another to see geographic (spatial) relationships of features on the earth was a simple GIS. In the late 1970's and early 1980's Automated Mapping/Facilities Management (AM/FM) emerged as an upcoming methodology for managing infrastructure. Many surveyors and engineers were involved in mapping, drafting, and providing electronic copies of infrastructure locations to clients during this timeframe. Also during the early 1980's GIS software began to emerge as the preferred technology to manage the infrastructure. At this time the process of "locating and mapping" the infrastructure was exclusively accomplished by

surveyors and engineers. The reason for this exclusivity was two fold. First, the legislative criteria in all states had clearly defined the "Practice of Surveying" or the "Practice of Engineering" to include many functions, one of which was the locating and mapping of features on the earth. Second, the technology was complex in that certain surveying equipment was required (transits, theodolites, total stations, electronic distance meters, etc.) and a specific skill set was required to operate the equipment. The cost for one to acquire the equipment was also mostly prohibitive.

The then emerging role played by GIS software (and GIS software operators) was simply to provide a structure to organize, manage, attribute, and analyze the data collected by others. The use of the term "GIS software operators" in no way correlates this example with the modern day GIS professional. It simply demonstrates that in the early 1980's GIS software was a small tool used by a number of technical people to manage data within an AM/FM system. Although specific GIS professionals were also emerging to use GIS software for many of the numerous advantages seen today, the emphasis of this discussion is to highlight the correlation to, and overlap with the professions of surveying and engineering. Notably, it was at this time that the use of modern day GIS technology began the journey to become an organized profession. Please note that the term "professional" as used herein is consistent with the ordinary definition in the dictionary and is not contingent upon any type of legislative authority or voluntary certification programs.

Over the time span since the early 1980's there have been substantial technological advances in hardware and software, including surveying equipment. Most notable among these is the Global Positioning System (GPS). In the early years this technology was even more expensive than standard surveying equipment and could only be afforded by those with substantial capital, which restricted its use to surveyors and some engineers with successful businesses and some government survey agencies. The GPS units at that time provided decimeter to centimeter level accuracy, and the equipment remained expensive until the mid-1990s. At that time lower accuracy "sub-meter" GPS units became affordable which were capable of precisions of about 1 to 3 meters. At the same time GPS equipment of centimeter to sub-centimeter accuracy also became more affordable (although still much more expensive than the sub-meter units), and this equipment began to be used by increasing numbers of surveyors and engineers. The term "survey grade" GPS unit was coined to distinguish this equipment from the sub-meter equipment. This terminology highlighted that fact that "survey grade" GPS equipment was considered acceptable for accurate survey work, whereas sub-meter equipment was not. Naturally the discussions of infrastructure location accuracy became pronounced. "Do we really need a manhole or fire hydrant location to centimeter accuracy for purposes of infrastructure management?" Surveyors tended to ignore the sub-meter units, and overall they chose not to be a part of survey work that would consider using equipment that provides such "rough" locations. This was due mostly to existing state laws that required a surveyor to accurately locate features. There was little room for sub-meter locations within the laws as written at the time and in most cases the laws remain unchanged.

A void now existed. The sub-meter GPS units could be afforded by people without substantial capital. And, since software and hardware vendors were focused solely on making a sale, non-surveyors and non-engineers began to purchase and operate these sub-meter GPS units. These new users began to refer to the units as either "non-survey grade", "resource grade", or "mapping

grade". During this timeframe the lines were beginning to be drawn in the sand. The premise of the new GPS users was that if they had a "mapping grade" GPS unit they were not performing surveys. This premise stoked controversy among surveyors, yet they chose not to take the lead on this issue. Instead they largely ignored the problem and allowed unchallenged use of sub-meter GPS units by non-registrants.

Although surveyors chose to mostly ignore the use of sub-meter GPS units they did manage to create some waves in a few states. Surveyors also were a heavy influence in the creation of the National Council of Examiners for Engineering and Surveying (NCEES) Model Law. Throughout this time period the use of sub-meter GPS units was increasing and, more specifically, the increase was accelerated by the GIS profession and the availability of less expensive, higher quality GPS devices. Surveyors increasingly shied away from conflict and took the position of not getting involved in GIS, claiming it to be only a cartoon. There was great hope within the general survey community that the users of sub-meter GPS units would make so many mistakes that the surveyors would be called upon to rectify their problems. There may be isolated incidents of this, but overwhelmingly there have been no disasters as anticipated.

A recent policy change that affected this debate was when the Federal government turned "off" Selective Availability (SA) in May 2000. SA was a deliberate degradation of the data provided by the satellites and it could only be removed by a code available only to approved (mainly military) users. In the presence of SA, data "post processing", differential corrections, or expensive relative positioning equipment (such as RTK) were required to obtain both sub-meter and sub-centimeter accuracies. Without such methods or equipment, SA degraded the real-time stand-alone (autonomous) accuracy of GPS to about 100 meters (300 feet). With SA off, even inexpensive consumer-grade GPS units could obtain real time autonomous positional accurate to within about 20 feet, and the recent addition of the free WAAS (Wide Area Augmentation Service) signal has improved accuracy to within (approximately) 6 feet. WAAS-enabled handheld units have become very affordable (in some case less than $200) which in some sense has made <u>everyone a surveyor</u>. Now the debate has heated up as to whether or not these new GPS users were performing surveying.

Arguably one can say that it has only been since the mid-1990's that locating features on the face of the earth by use of field equipment has exclusively fallen out of the hands of surveyors. One must ask the question at this point, "Since surveyors (engineers) have 'located features' for thousands of years with many different technological advances (ropes and poles, compasses and chains, sextants, transits, theodolites, total stations, EDMs, and GPS) why would this one single technological advance of a sub-meter GPS unit change history and the written laws?" This is a valid question to ask and analyze regarding a prime topic for discussion within the context of today's businesses of surveying, engineering, and GIS.

Today we see an ever-widening gap amongst the GPS community as data acquisition through inexpensive consumer-grade instruments grows (e.g., the typical hiker GPS). All data collected are in essence "GPS" and can be loosely described as a "survey." Anyone has the ability to collect GPS information (through whatever instrument is available) and publish this information to represent their latest quest. The gap appears to be widening, and issues surrounding the historical aspect of land surveying versus location based services are becoming more evident. Key to this entire scenario is the data/information itself, which includes understanding and identifying the development and applicable uses of such information.

Other issues are evolving that are directly applicable to surveying/engineering practice and GIS, such as data distribution and mixing of datasets. Another key issue is the "authority" of the data being presented to the "public". Rather than continuing to ignore the past ten or so years, APLS formed an ad-hoc committee in April 2002 (which has since become the permanent Geospatial Organization (GO) Committee). The initial committee consisted of thirteen prominent Arizona GIS and survey professionals who were targeted as instrumental players and invited to the first meeting. The relationship and bond that was formed at that time has created an organizational structure within APLS where GIS professionals can become full voting members of APLS and the GO has been designated as an official "chapter" within APLS thereby giving the GIS profession, and other geospatial professionals, full APLS Board representation and APLS Board voting rights. This accommodation was geared toward an offering to allow the GIS professionals an opportunity to have a structured professional organization recognized in the State of Arizona. This would allow the GIS professionals the opportunity to participate in a state professional organization as well as provide a structure and financial backing to solve issues of professional interest. The committee members clearly recognize the need for multi-discipline participation to solve issues that could potentially lead to a collision of practices. Legal battles, State Board of Technical Registration complaint issues, and all out disrespect of each other are all possibilities without joint cooperation. We in Arizona have recognized and prepared for a proactive and participatory solution to avoid Judgment Day.

APLS Geospatial Organization Committee

The APLS GO Committee was first commissioned by the APLS Board of Director as a subcommittee in July of 2002. The mission of the subcommittee was to determine the differences between the surveyor and the "geospatialists" (geospatial professionals) and to bridge the gap between these disciplines for the purpose of expanding the outreach of the association and by assimilating the practices for the protection of the public.

In 2004, the GO subcommittee was made a full committee of APLS with the development of a geospatial chapter which included a geospatial representative on the APLS board. With this advancement the work of the GO Committee was then solidified with a mission statement:

"*To act in the best interest of the public by providing Geospatial Professionals with a forum for promoting best practices, developing spatial standards, fostering education, and encouraging participation with Land Surveying and other relevant geospatial disciplines.*"

Harmony between the two professions within APLS was established, and the technically detailed education about both practices has been an on-going and positive activity amongst the APLS members. While the mission of the GO Committee continues to be met and expanded, the focus of the committee has been the development of spatial standards that would set a national trend model for other entities to emulate. More importantly, one of the most significant of these standards is to assist with defining the delineator between the practice of data collection for the purpose of surveying and data collection for feature attributes used in thematic mapping and analysis by geospatialist.

The Dresden Letter

In the early months of 2007, Larry Dresden, RLS (City Surveyor, City of Yuma) submitted a letter of concern to the State Board of Technical Registration (SBTR) highlighting portions of the Arizona Revised Statutes pertaining to the responsibility of the SBTR and the definition for

the practice of Land Surveying. His letter also reflected on the perpetuation of City Atlases showing Public Works Utilities created by the City of Yuma and the Geographic Information System (GIS) which the City uses for the maintenance and distribution of those maps.

After providing some detail of the City of Yuma's GIS development and the City's GIS coordinate systems and datums, Mr. Dresden's letter continued describing the City's mapping practice and his interpretation of the ARS as they may be applied to survey mapping. Mr. Dresden further identified a statement used by the City that purports to exempt planners from having to use surveyors to develop maps that are to be used for planning purposes in the City of Yuma. Elimination of the clause would ultimately prevent all of Arizona GIS and mapping practices unless performed under the supervision of a Licensed Surveyor.

Mr. Dresden's letter reads: 'Can a statement "***for planners and their planning purposes only***" allow people to circumvent what I feel are applicable statutes in regard to actively practicing Land Surveying and the licensing requirements as Land Surveyors or Civil Engineers?'

It is agreed that Mr. Dresden presents a good case for the SBTR's consideration, but more care should be given to this request before a determination is made. A decision that may have far reaching affects on the industry and the very charge of the SBTR, "provide for the ***safety, health and welfare*** of the public".

The APLS GO Committee has been tasked with a review and response to the Mr. Dresden's letter and to make a recommendation to be taken before the SBTR with the approval and support of APLS Board of Directors.

APLS is committed to finishing the work that was started by the GO Committee and in that process should provide the community and the SBTR a solid, organized understanding of the issues and possible solutions before any decisions rendered by the SBTR are made that could have long lasting repercussions on the concerned professions and associated industries.

A defendable position can be made to support either opinion on this issue. Conceivably, one position could hamper GIS development and one position could take survey data collection out of the hands of surveyors. APLS sincerely supports the idea that neither of these unilateral solutions are in the best interest of the public. In order to best "Protect the Public" there may need to be several actions initiated in the future, one possible action including the assimilation of geospatialists into the realm of profession registration.

Problems

Changing Technologies

Technology has dramatically advanced through recent years. New innovations in computer technology, GIS technology, easy-to-use software, GPS devices, and other systems have made it easier for a greater number of users to create geospatial data. In many ways, the technology has changed faster than policies and laws governing the use of geospatial technology. While users may now generate very precise data, these users may not understand the geodetic realities of the data they generate. This can lead to data being used for purposes that are not appropriate for how the data were developed.

The spectrum of GPS instruments (survey, mapping, and consumer-grade products) has increased throughout our environment, location based services have added a new dimension to society's ability to provide spatial context as well as informational context to any applicable situation. These instruments provide society a tool to easily collect (survey) data and publish geospatial data for the masses to review, use, and in some cases misuse. Key to the situation at hand is both the acquisition of the data, as well as proper classification of the processes used to obtain the positional information. Users of this information should be provided with reasonable, identifiable, and recognized standards for the collection and distribution of location based information. Otherwise it would be unwise to utilize the product, or one must simply assume such products have little value for large-scale mapping.

Two concerns come to mind with respect to this increased technology – people and data. Since the technology is market driven, the products (all grades) are obtainable by anyone willing to pay the price – using this technology is NOT licensed to an individual, nor is the generation of any information through the use of this technology licensed. It is imperative to the geospatial professions that any information provided have proper metadata associated to ensure proper use within any applicable system. Education of users and development of data collection standards is paramount to the proper interpretation of information. Geospatial technology now allows for (relatively) easy dissemination of location information to regional levels; hindering this technology has the potential to greatly impact emergency management (which speaks directly to "protecting the public").

Arizona Revised Statutes Interpretations

This section of the document provides for educating the reader on, both the *Strict* and *Flexible* application of the ARS 32-101.22(d). Without a definitive interpretation of the statutes it would remain too easy for a ruling in a judgment to be considered subjective, and would open any such case to challenge in a court of law. The following interpretations are illustrative; however, they serve as the foundation for any recommendations provided to the APLS Board of Directors and ultimately a recommendation from APLS to the SBTR.

Strict Interpretation of Arizona Revised Statute 32-101.22(d)

Regarding the main example of non registrants using GPS equipment to locate infrastructure we need to examine closely the applicable Arizona statute.

"*Measurement by angles, distances and elevations of natural or artificial features in the air, on the surface and immediate subsurface of the earth, within underground workings and on the surface or within bodies of water for the purpose of determining or establishing their location, size, shape, topography, grades, contours or water surface and depths, and the preparation and perpetuation of field note records and maps depicting these features.*"

Knowing that legislatures attempt to write laws to withstand the test of time and not be subject to frequent updates due to technology or methodology we can examine this statute. We also know that surveying equipment and methods have changed greatly over time. Even since the first registration laws in Arizona, circa 1921, the equipment and technology has changed significantly. Additionally, if one is to consider interpretation of statute, one should bear in mind that GPS (i.e., satellite-based positioning systems) is currently the most "advanced" positioning system, but it is virtually guaranteed that even more advanced and efficient systems will be developed.

Originally surveyors/engineers used transits, chains, alidades, and levels to measure "*by angles, distances and elevations…features…on the surface…of the earth…for the purpose of determining or establishing their location…*"

Then surveyors/engineers began using theodolites and electronic distance measuring (EDM) equipment to do the exact same thing.

Then surveyors/engineers began using "total stations" (an electronic combination of a theodolites and EDM) to do the exact same thing.

Then surveyors/engineers began using total stations and electronic data collectors to automate the exact same thing.

Then surveyors/engineers began using sub-centimeter GPS units to do the exact same thing.

The point here is that regardless of, or in spite of, technology it is the "*Measurement by angles, distances and elevations…features…on the surface…of the earth…for the purpose of determining or establishing their location…*" that has not changed. In other words, no matter what the technology might be, the way measurements are taken is not of issue. It is the act of measuring that constitutes surveying in accordance with this statute.

Along with this understanding we address the use of photogrammetry. In Arizona, by Attorney General Opinion and subsequent State Board of Technical Registration support, if photogrammetry is used to locate features or topography, or anything else indicated by the statute then the "acts" of the photogrammetry company constitutes the practice of land surveying in accordance with this statute. This makes sense in that the legislature could never predict and anticipate all the changes in technology that may offer new and improved methods for measurement. The "act" of measurement must withstand the test of time. So rather than measurement using a transit, theodolite, or GPS unit the photogrammetrist uses a machine, aerial photographs, precise survey control, and technical expertise to perform the "measurement".

After many years of evolving measurement techniques including EDMs (measurement by wavelength for reflected light) and GPS (measurement of satellite signals used for satellite trilateration) the statute defining the practice of land surveying was not seriously debated. There was no need to debate that which made legal and operational sense.

Now introduced are the sub-meter GPS units, which operate much more easily than sub-centimeter GPS units and are less expensive than the more accurate units. Nevertheless, <u>they perform the same function regarding the location of features on the earth</u>. But now should the statute be interpreted to mean something entirely different than how it has historically been applied? Are we to think that accuracy alone is the sole reason to consider the "acts" of these measurements to be something other than surveying?

The answer is undeniably "no". The statute does not address "accuracy" as a component to the location method. Generally, it is certain that sub-meter GPS is far more accurate than using the alidade, or transit and stadia. Typically we see improving accuracy through new technology, but efficiency is also a benefit.

If accuracy is not a component to defining the practice of surveying then can it be affordability? Now that non-surveyors can afford less expensive GPS units, then do they automatically get a pass to perform the tasks clearly outlined in ARS 32-101.22(d)? The answer is, "Absolutely not." The statute makes no reference to changing the "acts" of surveying based on what a person might be able to afford.

The statute has been in effect through numerous technological changes, accuracy changes, and affordability changes. None of the equipment or methodology changes has offered an entirely different interpretation of the statute until the hand held GPS units and the sub-meter GPS units fell into the hands of non registered people. It has been neglectful marketing and in many case misrepresentation of this equipment by the manufacturers of the equipment (and software) that has caused this problem.

Failure by surveyors or engineers to take an aggressive and proactive stance against non registrants using this equipment is not cause to believe there has been acquiescence in the neglect of this statute.

Whether one is using a transit, alidade, or sub-meter GPS unit to locate by measurement the features indicated in the statute they are practicing land surveying.

Flexible Application of Arizona Revised Statute 32-101.22(d)

Regarding the main example of non-registrants using GPS equipment to locate infrastructure we need to examine closely the applicable Arizona statute.

"Measurement by angles, distances and elevations of natural or artificial features in the air, on the surface and immediate subsurface of the earth, within underground workings and on the surface or within bodies of water for the purpose of determining or establishing their location, size, shape, topography, grades, contours or water surface and depths, and the preparation and perpetuation of field note records and maps depicting these features."

Legislatures make every attempt to write laws that withstand the test of time and are not subject to frequent updates due to technology or methodology. However, that does not mean the laws never need to be changed, nor does it mean interpretations of the laws must remain fixed and rigid. In fact, we have seen the Constitution of the United States be interpreted with slight advances as society evolves. Also there does tend to be a trend in law making that is reactionary legislation. Rarely do we see a law enacted that is truly visionary and ahead of it's time. We usually see laws written to either correct an operation of society, or to catch up to society. Often times when statutory laws fall behind the societal aspects the courts will step in and apply an "equitable" solution. They often stretch the meaning of the statute to accommodate real life, providing such interpretation will cause no harm.

The question at hand is whether the statute cited above is written such that interpretation can only result in one solution or to decide if the statute could be interpreted in a flexible manner.

Arizona Land Surveyors and Engineers were first regulated in 1921. At that time Land Surveyors could only perform boundary surveys. They could not even perform the type of survey currently under examination. In 1956 the law was revised such that surveyors could do construction staking and topographic surveys. This changed because surveyors were in fact doing those types of surveys for many years. The law has remained essentially the same since

then, 50 years. The change in 1956 did not include any revolutionizing language that points to technology being a factor in the change. It was simply to accommodate the societal change that had already occurred. There has been minor tweaking of the language since 1956, but never to the extent technology was the driving factor. So we are essentially looking at a statute that was implemented over 85 years ago. Obviously at that time lawmakers could never envision technology advancing to where it is today. It is doubtful anyone could have anticipated the evolution of total stations, let alone GPS. So at that time and subsequent thereto, the mindset of the legislation regarding surveying was that lawmakers envisioned a surveyor with crew and equipment making measurements in the field. Surely when we examine the term "measurement" within the statutes the legislature had a clear picture of a surveyor standing in the field making physical field measurements with some type of "survey instrument". In examining many definitions of a "surveyor" one will see that the emphasis to define a surveyor as one who performs "detailed examination" and uses a "survey instrument". When examining the many definitions of "survey instrument" one will occasionally find generic reference to "electromechanical or mechanical" devices used to measure features. GPS does fall within the "electromechanical" category. However, up until GPS the mechanical operating skills required to operate survey instruments far surpassed the abilities of a non surveyor. Interpretation of the mechanics of the equipment, understanding of trigonometry and geometry, calculations, and physical skills were necessary to properly make measurements.

GPS has changed the skill set. GPS requires knowledge of coordinate systems, geographic projections, data transfer, and understanding software operation. The physical skills have given way to mental skills. The need to apply specific measurement techniques is substantially less than ever before. Granted someone may need to hold a rod in the plumb position, but the primary measurement skills acquired by a surveyor to be used with all prior survey equipment is not a part of the equation. As such it seems reasonable to believe that the intended application of the word "measurement" in the statute has an entirely different meaning than any law maker imagined. A surveyor does possess the new skill set as mentioned and is certainly qualified to utilize GPS as a measurement tool, but cannot claim they are the only "qualified" people to operate such equipment.

Additionally the main reasons surveyors/engineers would perform topological surveying was primarily for construction of subdivisions, roads, utilities, etc. Rarely did surveyors (aside from the AM/FM projects in the 1980's) accomplish surveys for simply locating fire hydrants, or manholes, etc. In fact many of the old utility maps, some still in use today, were created by field workers making measurements from curb lines and poles, etc. Surveyors and engineers have used these maps as reference for many years and never contended the field workers were "surveying". That is because everyone knew the nature of the maps. They were "rough" measurements used by maintenance staff to facilitate asset management. The clear analogy that can be drawn here is that the Tax Assessors do not perform land surveying although their product (tax maps) sure does look like a survey in many cases. We all know these maps are nothing more than a "rough" diagram for reference.

However, a caveat must be offered. The old school method of locating and plotting asset features was often accomplished on maps with very small scales. Also, these maps were not readily distributed to the general public. And, when they were given to surveyors/engineers they often contained a stamp indicating the relative accuracy of the features with a disclaimer. It is

this area of "Data Distribution" that offers potential to harm the public. Since GPS data collection offers many decimal place coordinate values, rather than to the nearest foot, when data files are transferred or displayed on a website there is a clear presumption that the accuracy is greater than any disclaimer might attempt to clarify. This topic of "Data Distribution" is a separate issue and may not even be a component for discussion within the context of the "Practice of Surveying".

In conclusion sub-meter GPS location of infrastructure assets for the use in maintenance operations is no different than "roughly" locating the very same features by crude methods and plotting them on utility maps. That practice has never been considered the "Practice of Land Surveying" and should not be considered as such now simply because technology has improved efficiency.

Since we have concluded that the location of infrastructure assets using sub-meter GPS by non-registrants is not in violation of the law it is fair to offer other examples of modern day GIS practices for thought that "might be" considered the "Practice of Surveying/or Engineering".

APLS GO Committee Observations

The National Council of Examiners for Engineering and Surveying (NCEES)

The NCEES is a national non-profit organization composed of engineering and surveying licensing boards representing all states and U.S. territories. The NCEES has provided recommendations for adoption by states to better define the issues that have arisen from the use of Geographic Information Systems and their associated tools for the development of informational maps and analysis. While NCEES Model Laws and Model Rules are guidelines for voluntarily use by state regulatory boards across US Territories, it is not the recommendation of this organization to use the NCEES Model Law or Model Rules to make revisions to the ARS or to SBTR policies or rules. The vast majority of the NCEES document deals with testing and other issues that are beyond the scope of this study. However, there are some key concepts that the NCEES does provide which may be useful to the issues currently faced in Arizona.

For example, a portion of the NCEES definition of the Practice of Land Surveying states:

"… the making of geometric measurements and gathering related information pertaining to the physical or legal features of the earth, improvements on the earth, the space above, on, or below the earth… providing, utilizing, or developing the same into survey products such as graphics, data, maps, plans, reports, descriptions, or projects."

This can be compared to Arizona Revised Statute which contains similar language:

"…Measurement by angles, distances and elevations of natural or artificial features in the air, on the surface and immediate subsurface of the earth, within underground workings and on the surface or within bodies of water for the purpose of determining or establishing their location, size, shape, topography, grades, contours or water surface and depths, and the preparation and perpetuation of field note records and maps depicting these features…"

In 2000, the American Photogrammetrists and Remote Sensing Association (ASPRS), assembled a Geospatial Committee, made up of individuals from several professional

associations representing surveyors, geodesists, photogrammetrists and GIS professionals to review and make recommendations to the NCEES to incorporate geospatial practices into the Model Law. The group met for over a year and developed a series of consensual recommendations which were then presented to the NCEES. These recommendations were incorporated into the current version of the NCEES Model Law and Model Rules. These guidelines provide examples of activities and uses of geospatial data to be included or excluded from the Practice of Land Surveying.

The GO Committee is not recommending utilization of the NCEES Model Law to modify Arizona Revised Statutes or the way the SBTR conducts testing and registration of practitioners in Arizona. However, these guidelines were developed by a group of geospatial professionals, with diverse backgrounds, and may provide useful information for the GO Committee, and others, to consider.

A major guideline of the NCEES Model Rule regards how geospatial data is used, rather than by whom or how it was developed. The NCEES Model Rules do not focus on what equipment was used or the accuracy of the data developed, but whether the data is used to 'authoritatively' represent the location of a boundary mapped feature. If it is to be the authoritative location record, then it should by developed by a registrant. If it is not the authoritative location record, it may not need to be developed by a registrant.

The GO Committee believes the best approach is to focus on the use of geospatial data and not on the licensing, registration or certification of geospatial professionals as a general rule. The Committee believes that whether geospatial data are used as an "authoritative" location of a boundary or geographic feature is the most relevant aspect of whether geospatial data must be developed by a registered professional.

Additional information regarding the NCEES' Model Law can be found on the NCEES web page (www.ncees.org).

The State of Oregon (An Example From Another State)

Oregon State Board of Examiners for Engineering and Land Surveying and Oregon Geographic Information Council

In the State of Oregon a task force was charged with looking at the issues being faced by the disciplines of geospatialist and surveyors. The issues were all very similar to the issues faced by the practitioners of these industries in the NCEES Geospatial Committee and here in Arizona and documented by the APLS GO Subcommittee. The key recommendations resulting from the Oregon State Task Force are:

- GIS Data and products should always be accompanied by a clear disclaimer
- GIS Professionals should AT A MINIMUM be certified
- State Law should be changed to reflect NCEES Model Law & Rules

The Oregon Geographic Information Council (OGIC) officially adopts the following spatial data disclaimer, developed in collaboration with the Oregon Attorney General's Office in 2002, for inclusion on all printed (hardcopy) map products:

"This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information."

Furthermore, the OGIC defined its official policy to include that:

- the adopted disclaimer be used on all hard copy maps produced from geospatial data, and that the date and source of the data be included on the map;
- spatial data producers be allowed to extend the adopted disclaimer with additional language further defining the limits of their liability;
- a more robust disclaimer may be used in conjunction with any and all geospatial data published on the Internet, on a separate page preceding access to the data, with an accept/reject option for users; and
- standardized metadata be included with any distribution of all geospatial data.
- the disclaimer above may be used as a blanket disclaimer for documents containing a number of small maps

Oregon State Board of Examiners for Engineering and Land Surveying (OSBEELS) adopted the exceptions to the NCEES Model Rule which provided a platform for delineation between surveying and geospatial map production.

* Please Note: Disclaimers alone do not necessarily promote "Protecting the Public" nor do they offer true education or understanding for user benefit. Disclaimers are self serving vehicles to reduce liability and put users on notice. The Geospatial professions must take steps in addition to recommendation of disclaimers to minimize misuse of data by the public, or others. Scale dependency, vintages, and analytical data should be governed by standards to be developed in the future by the GO Committee.

The Delineation Test for Non-Surveying

If you could answer "Yes" to the following questions, you ***were not*** considered to be surveying.

1. Was data brought into a GIS/LIS format by means clearly not intended to represent authoritative delineations?
2. Did generation of data involve transcribing cadastral, zoning, or other public information where information were clearly not intended to represent authoritative property delineations?
3. Were data developed used to depict cultural resources, features or phenomena and clearly not intended to represent authoritative delineations?
4. Was act performed by Feds (or contractor), for military, quad, or topo maps not depicting real property?
5. Was act performed by Feds (or contractor) for incorporation to a GIS/LIS?
6. Was act performed by law enforcement to depict events relevant to respective needs?
7. Was act performed by peace officer in connection to an official investigation?
8. Did act result in generation of general map product for private of governmental agencies used in:
    - Transportation Guide
    - Gazetteer information
    - Curriculum data/information

- Graphic illustration of location (event)
- Use in advertising

The Oregon Delineation Test for Surveying (Example)

If you could answer "Yes" to the following questions, you ***were*** considered to be surveying.

1. Does it provide of offer to provide professional services that apply mathematics, geodesy and other sciences and involve the making of geometric measurements and related information pertaining to **physical or legal features of the earth into graphics, data, maps, plans, reports, descriptions, projects or other SURVEY products**
2. Does it provide of offer to provide professional services that apply mathematics, geodesy and other sciences and involve the making of geometric measurements and related information pertaining to **improvements on the earth into graphics, data, maps, plans, reports, descriptions, projects or other SURVEY products**
3. Does it provide of offer to provide professional services that apply mathematics, geodesy and other sciences and involve the making of geometric measurements and related information pertaining to **the space above or below the earth into graphics, data, maps, plans, reports, descriptions, projects or other SURVEY products**
4. Does it provide of offer to provide professional services that apply mathematics, geodesy and other sciences and involve the making of geometric measurements and related information pertaining to **the development of measurements and information**
5. **Is it a geodetic survey?**
6. **Does it establish or re-establish control points (reference monumentation)**
7. **Does it establish or re-establish property lines or boundaries?**
8. **Was it a survey for the division of land or consolidation of lands?**
9. **Does it involve construction layouts?**
10. **Does it involve consulting to items expressed above?**
11. **Does it involve collection, prep, manipulation, or mods of items above?**
12. **Did it fall within the new definition of photogrammetric mapping?**
13. **Did it result in surveys resulting in horizontal or vertical mapping or geodetic control?**

The above *"delineation tests"* are checklists that follow the NCEES Model Rules and adhere to the intention developed through the NCEES Process. This process was developed through a joint effort of nationally recognized "professionals" considering the current situation with regards to Land Surveying, Engineering, Photogrammetry, and other sources of Geospatial Information.

The key to the development of language within the Oregon model is that it speaks to the data rather than methodology or personnel used in the collection process. Separating the data/information from the process allows users to understand the limitations of any data set provided. This is valuable when entities utilize shared resource (data) to provide information to users. Understanding the collection methodology and the proper use of such information is inherent to the metadata associated to any shared data source. What is demonstrated here is the separation of technology (acquisition tools) from either side of the people equation and only leverages how this information should be used in context to the environment they exist. It also assists in the understanding of appropriate / applicable use for information – a key component for data management.

Options

Do Nothing

- The SBTR will most likely utilize the strict interpretation of existing Arizona State Statute.

Adopt (recommend to SBTR) portions of the NCEES Model Law

- Utilize NCEES rules and exceptions to establish guidelines and policies that will help define the use of geospatial data in Arizona.

- Focus on data not on people.

- Integrate Spatial Data Collection Standards (as developed via GO Committee) to assist in regulating process for data collection.

Oregon and Maybe Other States' potential solutions

- Utilize the work done in Oregon, and other states, and capitalize on those aspects that address the needs in Arizona to develop a pragmatic solution to the proper use of geospatial data.

Next Steps

Forums

Revision of Paper into Recommendations

APLS Board

SBTR legislative & Rules Committee